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ABSTRACT

Direct and repeated measurement of academic performance in the curriculum is an alternative to traditional referral and assessment models used in psychoeducational evaluation. This study (with 107 intermediate grade students at high risk for learning disability) contrasted a screening and referral procedure that used weekly measurement of performance in reading, spelling, and written expression with a traditional teacher referral procedure. The groups were compared with respect to referral rate, cognitive functioning, achievement level, social behavior, sex differences, and identification as learning disabled. The number of students referred through weekly measurement was similar to those referred by teachers. In addition, the results indicated that academic achievement is almost the sole criterion used in teacher referral, although teacher-referred students appeared to be more likely to be rated as behavior problems. Finally, students referred through weekly achievement measurement were as likely to have an aptitude-achievement discrepancy as students referred by teachers. (Author/DB)

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Research Report No. 75

# DIRECT AND REPEATED MEASUREMENT OF ACADEMIC SKILLS: AN ALTERNATIVE TO TRADITIONAL SCREENING, REFERRAL, AND IDENTIFICATION OF LEARNING DISABLED STUDENTS

Phyllis Mirkin, Doug Marston, and Stanley L. Deno

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May, 1982

Abstract

Direct and repeated measurement of academic performance in the curriculum is an alternative to traditional referral and assessment models used in psychoeducational evaluation. This study contrasted a screening and referral procedure that used weekly measurement of performance in reading, spelling, and written expression with a traditional teacher referral procedure. The groups were compared with respect to referral rate, cognitive functioning, achievement level, social behavior, sex differences, and identification as learning disabled. The number of students referred through weekly measurement was similar to those referred by teachers. In addition, the results indicated that academic achievement is almost the sole criterion used in teacher referral, although teacher-referred students appeared to be more likely to be rated as behavior problems. Finally, students referred through weekly achievement measurement were as likely to have an aptitude-achievement discrepancy as students referred by teachers.

## Direct and Repeated Measurement of Academic Skills: An Alternative to Traditional Screening, Referral, and Identification of Learning Disabled Students

The role of bias in the referral and identification decision-making process in special education currently receives much attention. Significant factors that appear to affect the referral process include the influence of student characteristics upon teacher-pupil interactions, the effect of current placement team decision-making practices, and the impact of insiitutional constraints and external pressures.

It would appear that several kinds of pupil characteristics differentially affect teacher-pupil interactions and diagnostic outcomes. Socioeconomic status of the student significantly affects teacher prediction of pupil performance (Miller, McLaughlin, Haddon, & Chansky, 1968). Teacher predictions also have been shown to be affected by the sex of the student (Jackson & Lahaderne, 1967; Schlosser & Algozzine, 1979). Another naturally-occurring student characteristic that influences teacher-pupil interactions and diagnostic outcomes is physical attractiveness (Berscheid & Walster, 1974; Ross & Salvia, 1975).

Placement team practices also contribute bias to the referral and identification decision-making process. In a study of simulated decision making, Ysseldyke, Algozzine, Regan, and Potter (1980) determined that school personnel frequently selected technically inadequate assessment procedures. The decision makers also tended to

identify pupils as emotionally disturbed, using teacher complaints as the sole basis for diagnosis and disregarding behavioral assessment data (Ysseldyke & Algozzine, in press). In addition, 51% of the decision makers pronounced a normal student with average performance on achievement and intellectual measures as eligible for special education services (Algozzine & Ysseldyke, 1981). Investigation of decisions made by placement teams further demonstrated virtually no relationship between the assessment data submitted at team meetings and the decisions reached by the teams (Ysseldyke, Algozzine, Richey, & Graden, 1982). Finally, in a survey of Colorado LD programs, Shepard and Smith (1981) found that 45% of the students served did not meet the state placement requirements.

Christenson, Ysseldyke, and Algozzine (1981) reported that many types of institutional constraints and external pressures bias the referral and identification decision-making process. Referral rates vary with the guidelines established by the school district, the perceived competence of the person receiving the referral, the kind of referral form used, and the amount of paperwork required, as well as teacher attitudes and theoretical beliefs. Referral and identification rates are also a function of external pressures such as the sociopolitical climate, external agency influences, federal and state guidelines, and parental pressure.

In all, the many biases operating in referral and identification procedures contribute considerable variability to the process. Glass (1981) regarded current diagnostic procedures as arbitrary, while Scriven (1981) labeled them a "diagnostic scandal." Because

inconsistency is so prevalent, the veracity of the current approach is questioned and alternatives are sought.

One potential candidate is the use of direct and frequent performance measurement of the student's academic skills (Lovitt, 1967). For purposes of determining a child's eligibility for special education, Jenkins, Deno, and Mirkin (1979) proposed that continuous measurement of a child's skills in an identified academic area be compared to minimal acceptable performance in this area. The concurrent validity of such measurement procedures has been established for the number of words read correctly in one minute from a basal reader (Deno, Mirkin, Chiang, & Lowry, 1982), the number of correctly spelled words from dictated lists (Deno, Mirkin, Lowry, & Kuehnle, 1980), and the total number of words written on a story starter (Deno, Marston, & Mirkin, 1982). However, the appropriateness of the techniques for use in referral and eligibility decisions has not yet been confirmed.

The intent of this study was to pilot test an alternative method of referral, one based upon continuous evaluation of objective classroom data. Employing a set of procedures developed at the University of Minnesota Institute for Research on Learning Disabilities, continuous evaluation procedures were implemented in five elementary schools. Referrals made using this system then were compared with the traditional, teacher-initiated referral model. We hypothesized that referrals made with the more objective system would be free of the factors often biasing referral decisions.

## Method

### Subjects

Three referral groups were compared. Group I referrals were identified with the continuous evaluation model. These subjects were referred from among a group of "high-risk" students selected from the population of students at five elementary schools because they had scored at or below the 15th percentile on a measure of written expression. The high-risk students were tested weekly on measures of reading, spelling, and written expression; referral decisions were made on the basis of their performance. Group II subjects were from the same five elementary schools as the Group I referrals, but were referred as a result of the traditional teacher referral process. Subjects in Group III also were teacher referred. However, the home elementary school for these referred subjects was different from the Group I and II schools.

All elementary schools included in the study were located within a 50-mile radius of a large metropolitan area in the Midwest. The schools generally were located in small town, rural settings. Only third through sixth grade students were included in the study. School populations ranged from 110 to 696.

### Procedures

Group I referrals. Third, fourth, fifth, and sixth graders (n=1374) from five elementary schools were screened in early September using a measure of written expression, a procedure that has successfully differentiated LD and non-LD students (Deno, Marston, & Mirkin, 1982). During the screening phase, each student was given two

story starters and asked to write a brief story for each. Students were given three minutes to write each composition. Only the compositions from the second administration were scored and analyzed; the first administration was considered to be practice on the task. The second story starter stated, "Long, long ago in a distant galaxy the evil forces were...." The number of words written on the composition then was tabulated for each student. Parents of those students who scored in the lowest 15% for their grade on total words written and who had no history of previous special services were then asked for permission to have their son/daughter participate in the direct measurement phase of the study. The 15th percentile cutoffs for each grade level are found in Table 1. Parental permission was received for 107 students from the five schools; included were 33 third graders, 25 fourth graders, 27 fifth graders, and 22 sixth graders. Seventy of the "high-risk" students were males and 37 were females.

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Insert Table 1 about here

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Weekly, direct measurement for the high-risk population began in the first week of October and continued for ten weeks. Each week the 107 students were asked to complete a reading, spelling, and writing task administered by the schools' special education teachers. Student performance then was scored and the data for each academic area were plotted on a graph.

For the reading task, each child was asked to read a list of

words randomly selected from the third grade level of the Harris-Jacobson (1972) word list. Each week the student was given a different list and asked to read aloud for one minute. The number of words read correctly then were counted and charted on graph paper.

Words randomly selected from the third grade level of the Harris-Jacobson (1972) word list also were used for the spelling task. Students were dictated 20 words over a five-minute period (one every 15 seconds) each week. Teachers then counted the number of words spelled correctly and charted the results for each child on a graph.

Direct measurement of written expression consisted of administering a different story starter each week. The total number of words written on each composition was charted on a graph.

Information gathered on the 107 students during the measurement phase was used to make group I referrals midway through the 10-week measurement period and again after 10 weeks. Three models were used to generate referrals: the standard deviation model, the grade discrepancy model, and the performance discrepancy model.

In the standard deviation model, a student met the referral criterion if he/she performed at a level more than two standard deviations (SD) below the mean for his/her grade level on either the reading, spelling, or written expression measures. Since this criterion for third graders resulted in a negative number for reading, 1 1/2 SD below the mean was used for this grade level, for reading only.

Rather than use grade means from data collected from different parts of the country, a set of local norms was established for use in

the standard deviation model. Forty students, 10 each from grades 3, 4, 5, and 6, were selected randomly from one of the schools participating in the study. The mean scores of the students from each of these grades were used to set the criteria of 2 SD below the mean. The specific referral criteria for each grade are shown in Table 2. Unfortunately, two subjects were lost when establishing the sixth grade norms. This factor may account for the depression in the sixth grade means, which in past studies have been superior to fifth grade means (Deno, Marston, & Mirkin, 1982; Deno, Mirkin, & Chiang, in press).

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Insert Table 2 about here

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The performance discrepancy model focused on the child who was at least 50% discrepant from his/her grade level mean. Again, a set of local norms was used to establish referral criteria within this model. For example, a fourth grader meets the criteria for words read correctly if he/she is 50% discrepant from the fourth grade mean of 74.5. This child must be reading at a rate of 37.25 or less words correct on the reading measure to be referred. Referral criteria for the performance discrepancy model are given in Table 3.

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Insert Table 3 about here

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The third model, the grade discrepancy model, also was used to make referrals. Using this model a child is eligible for referral if

he/she functions at a level less than the mean performance level of students two grade levels below the student's own grade level. Spelling is not included in this model because descriptive data were not available for all grade levels. Criteria for this model were established from previous research (Marston, Lowry, Deno, Mirkin, Sindelar, & Jenkins, 1982). Referral criteria are found in Table 4.

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Insert Table 4 about here

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As noted previously, the three referral models were used to examine the mean performance of each of the 107 high-risk students five weeks into the measurement period. Given that a student would not be referred for spelling under the grade discrepancy model, there were eight possible criteria: standard deviation criterion for reading, grade discrepancy criterion for reading, performance discrepancy criterion for reading, standard deviation criterion for spelling, performance discrepancy criterion for spelling, standard deviation criterion for written expression, grade discrepancy criterion for writing, and performance criterion for writing.

A frequency distribution of the numbers of students meeting one or more referral criteria is displayed in Figure 1. Based on this distribution, a rule was established that only students who met four or more referral criteria (at least 50% of those possible) would be considered for referral at the five-week review. Using this rule, 16 of the 107 students (15%) were referred to the school psychologists at the midway point of the study.

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Insert Figure 1 about here

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At the end of 10 weeks of measurement in reading, spelling, and written expression, performances of the 107 students again were examined to determine referral eligibility. At this point, the standard deviation model was used in preference to the performance discrepancy model, since the latter model seemed to over-classify the younger students (i.e., 16 of the 33 third graders met the referral criterion in reading). To employ the standard deviation model at the 10-week point, local norms again were developed using data collected at the end of the project from 38 randomly selected students. The local norms were used with the added stipulation that a student had to qualify in at least two of three academic areas to be referred. Figure 2 is illustrative of the performance of two fourth grade students assessed with the alternative referral model. The referral criterion for fourth grade students was performance at or below 35.1 words correct. Student A read an average of 50 words correct per minute and was not referred for learning disabilities assessment. Student B, however, averaged 17 words per minute and was referred.

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Insert Figure 2 about here

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At the end of 10 weeks, 36 students were referred. Included in this group were the 16 students originally referred at five weeks. Their performance during the second five-week period further confirmed

their eligibility for referral. The average grade level of the 36 students was 4.6. In all, 31% of the high risk population (n=107) was referred, and 2.4% of the elementary population originally screened (n=1374) met the referral criteria.

Group II referrals. Group II referrals were students from the same five elementary schools who were referred for LD services by their teachers. According to district guidelines, teachers first had to initiate an intervention with a potential candidate for referral. If the intervention plan failed, the student could then be referred for psychoeducational evaluation. Of the 1374 students in grades 3 through 6, 25 (1.8%) were referred for learning disabilities assessment by their teachers. The average grade level of these students was 4.8.

Group III referrals. The Group III referrals also were students who had been referred by their teachers. These students, however, were enrolled in a sixth elementary school that represented a non-equivalent control group. Fifteen of the 895 students in grades 3-6 in this school (1.7%) were referred by teachers for psychoeducational evaluation. The average grade level for these students was 4.8.

Data Analysis

To compare aptitude and achievement characteristics of the referred students, the results of standardized tests administered to each referred student were examined. Fifty-nine of the 66 referred students (those for whom parental permission was obtained) were administered the Tests of Cognitive Ability and Achievement from the Woodcock-Johnson Psycho-Educational Battery (Woodcock & Johnson,

1977). Aptitude-achievement difference scores and percentile ranks were examined.

To assess the social behaviors of the referred students, the primary teachers for children in groups I and II were asked to complete a social behavior rating scale, the School Behavior Profile (Balow & Rubin, 1974). The mean school behavior ratings for Groups I and II were examined with a t test analysis.

## Results

### Cognitive Ability

The intellectual functioning of the group I, II, and III referrals was measured with the Tests of Cognitive Ability from the Woodcock-Johnson Psycho-Educational Battery (WJPEB). Group I was contrasted with both group II and group III in separate t test analyses using percentile ranks as the dependent variable. As may be seen in Table 5, there were no reliable mean differences for each comparison on the WJPEB Full Scale, Reading Aptitude, Math Aptitude, and Written Language Aptitude cluster scores.

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Insert Table 5 about here

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### Academic Achievement

School achievement of the referrals from groups I, II, and III was assessed with the WJPEB achievement tests of Reading, Math, and Written Language. The data presented in Table 6 indicate that of the six comparisons of mean percentile rank scores, only the means of groups I and III on the Math cluster differed significantly (t=2.07,

$p$=.05).

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Insert Table 6 about here

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Aptitude-Achievement Discrepancies

Weekly measurement referral students (group I) also were compared to the teacher referral students (groups II and III) on WJPEB aptitude-achievement discrepancy scores. The mean cluster difference scores for the comparison groups are found in Table 7. Again, there were no significant differences between groups I and II. For groups I and III, only the difference in Math was significant (t=2.17, $p$=.04).

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Insert Table 7 about here

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Social Behavior

Teachers of the students in groups I and II were asked to complete Balow and Rubin's (1974) School Behavior Profile. Low scores (ratings) are indicative of behavior problems in school. Group I and II students did not differ significantly on the school behavior measure. The mean rating for group I referrals was 182.0; for group II referrals, the mean rating was 177.3 (t=.60, $p$=.43).

Sex

The influence of the student's sex also was examined. It was noted that 80% of the teacher referrals (group II) were males, while 66% of those referred from weekly measurement data were male. Using expected frequencies based upon equal distribution of the sexes, a

chi-square analysis indicated that the distribution of sexes in group I met normal assumptions ($\chi^2=2.41$, $p < .10$). However, the same analysis of Group II suggested that males were referred more often than would be expected ($\chi^2=9.84$, $p < .005$).

Additionally, sex differences in school behavior within the referral groups were studied. Males in referral groups I and II received equivalent ratings (group I $\bar{X}$ = 180.7, group II $\bar{X}$ = 182.8). Group II females, however, were rated differently from Group I female referrals (group I $\bar{X}$ = 184.3, group II $\bar{X}$ = 154.0). These four group means were tested with a two-way analysis of variance. As shown in Table 8, the unique contribution of the sex and referral factors to the variance of school behavior scores was not significant. However, the interaction of sex and referral group approached significance ($F=3.30$, $p=.08$).

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Insert Table 8 about here

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Eligibility

A final result of interest is the extent to which the school district decided to categorize group I and II referrals as learning disabled. Five of the group I referrals were declared eligible for LD services while 11 of the group II referrals were declared eligible for LD services. The school district specifies that only children demonstrating a 20-point discrepancy on the Woodcock-Johnson Psycho-Educational Battery ability and achievement clusters in one or more areas may be declared eligible for LD services. Of the five

group I referrals identified as LD, 80% met the district LD criterion, whereas only 36% of the group II referrals (n=11) identified as LD met the criterion.

## Discussion

The comparison of the traditional, teacher-referral process with an alternative model based upon weekly measurement of academic behaviors fostered four significant findings. First, the approximately equivalent and low performance of both groups of referred students on the aptitude and achievement measures assures us that students identified by the continuous evaluation process are likely candidates for referral. If continuous evaluation had selected students performing better than teacher referrals, considerable doubt concerning the utility of the procedures would be expressed.

Second, it appears that the distribution of males and females is more even when the continuous evaluation model is used for referral. This finding is significant only if one is willing to assume that males and females share equal probabilities of having learning difficulties.

Third, the data suggest that behavior influences teachers' referral decision about females. Although the statistical test only approached significance, teacher-referred females were rated as having more behavior difficulties than females referred in the same classroom through the continuous evaluation model. This finding, although it does not extend to males, indicates that the teacher referral process for academic problems is subject to the biasing influence of the student's behavior.

Finally, it was evident that referrals made by teachers were treated differently than those referrals made from continuous evaluation criteria. As pointed out earlier, about one third of the teacher-referred students who were identified as LD met the established district criterion for entrance into learning disability programs, while about 80% of the referrals from the continuous evaluation model that were labeled LD met the criterion. One conclusion to be drawn from this finding is that teacher referrals receive differential treatment (or perhaps bias) in the decision-making process. It appears that 64% of group II students were labeled LD for reasons other than those specified in the established guidelines. These unidentified reasons, however, did not contribute to the decision-making process for the continuous evaluation referrals. It may be that the continuous evaluation referral system creates more consistency in the assessment process.

In summary, the continuous evaluation model compares favorably with the teacher-referral process. It refers approximately the same number of students and appears to negate the influence of factors that often bias assessment (e.g., sex, social behavior). Such an endeavor is not the first of its kind. Magliocca, Rinaldi, Crew, and Kunzelmann (1977) used a similar system in Baltimore to refer students in preschool classes. These authors suggested that their procedures were nondiscriminatory. The favorable outcomes reported here and in Baltimore suggest that weekly measurement is a feasible and efficacious approach to making referral decisions. Additionally, weekly measurement of academic skills includes the benefits of

measuring progress on Individual Education Plan goals (Jenkins, Deno, & Mirkin, 1979). In all, the continuous evaluation model holds great promise for assessing students with special learning problems.

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Footnote

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Table 1

Screening Criteria for Total Words Written

| Grade | Sample Size | Mean | Cut-Off for 15th Percentile |
|---|---|---|---|
| 3 | 729 | 17.7 | 9 |
| 4 | 724 | 22.7 | 12 |
| 5 | 896 | 30.5 | 19 |
| 6 | 870 | 36.4 | 24 |

Table 2

Standard Deviation Model Referral Criteria for Reading, Spelling, and Written Expression[a]

| | Words Read Correctly | | | Words Spelled Correctly | | | Total Words Written | | |
|---|---|---|---|---|---|---|---|---|---|
| Grade | Mean | SD | Referral Criteria | Mean | SD | Referral Criteria | Mean | SD | Referral Criteria |
| 3 | 47.1 | 24.1 | 11.0 | 11.6 | 4.3 | 3.0 | 33.3 | 8.0 | 17.3 |
| 4 | 74.5 | 19.7 | 35.1 | 14.4 | 3.2 | 8.0 | 36.6 | 9.7 | 17.2 |
| 5 | 77.0 | 24.4 | 28.2 | 17.0 | 2.9 | 11.2 | 43.1 | 11.0 | 21.1 |
| 6 | 73.1 | 21.5 | 30.1 | 16.7 | 2.1 | 12.5 | 39.1 | 7.3 | 24.5 |

[a]For referral under this model, the child must be at least 2 SD below the grade level mean.

Table 3

Performance Discrepancy Model Referral Criteria for Reading, Spelling, and Written Expression[a]

| Grade | Words Read Correctly | | Words Spelled Correctly | | Total Words Written | |
|---|---|---|---|---|---|---|
| | Mean | 50% Discrepancy | Mean | 50% Discrepancy | Mean | 50% Discrepancy |
| 3 | 47.1 | 23.6 | 11.6 | 5.8 | 33.3 | 16.7 |
| 4 | 74.5 | 37.3 | 14.4 | 7.2 | 36.6 | 18.3 |
| 5 | 77.0 | 38.5 | 17.0 | 8.5 | 43.1 | 21.6 |
| 6 | 73.1 | 36.6 | 16.7 | 8.4 | 39.1 | 19.6 |

[a]For referral under this model, the child must be at least 50% discrepant from the grade level mean.

Table 4

Grade Discrepancy Model Referral Criteria for Reading and Written Expression[a]

| Grade | Words Read Correctly | Total Words Written |
|---|---|---|
| 3 | 3.3 | 5.5 |
| 4 | 24.2 | 18.0 |
| 5 | 51.4 | 30.8 |
| 6 | 61.5 | 35.2 |

[a]For referral under this model, the child must be at least 2 grades below his/her placement.

Table 5

Analysis of Mean Percentile Ranks of Groups I, II, and III on Woodcock-Johnson Aptitude Clusters[a]

| Cluster | Mean %ile Rank | t[b] | p |
|---|---|---|---|
| Full Scale | | | |
| Group II | 28.6 | | |
| | | .70 | .489 |
| Group I | 33.0 | | |
| | | .18 | .858 |
| Group III | 34.3 | | |
| Reading | | | |
| Group II | 33.2 | | |
| | | .43 | .666 |
| Group I | 36.4 | | |
| | | .57 | .569 |
| Group III | 40.3 | | |
| Math | | | |
| Group II | 28.1 | | |
| | | .77 | .446 |
| Group I | 33.6 | | |
| | | .14 | .891 |
| Group III | 34.5 | | |
| Written Language | | | |
| Group II | 31.4 | | |
| | | .19 | .853 |
| Group I | 32.6 | | |
| | | .06 | .954 |
| Group III | 32.2 | | |

[a]Samples for groups were 23 (Group I), 25 (Group II), and 22 (Group III).

[b]Analysis compared the ranks of Groups I and II and the ranks of Groups I and III.

Table 6

Analysis of Mean Aptitude-Achievement Difference Scores of Groups I, II, and III on Woodcock-Johnson Psycho-Educational Battery[a]

| Aptitude-Achievement Difference Score | Mean %ile Rank | t[b] | p |
|---|---|---|---|
| Reading | | | |
| Group II | -4.5 | | |
| | | .87 | .388 |
| Group I | -8.1 | | |
| | | .64 | .526 |
| Group III | -8.8 | | |
| Math | | | |
| Group II | - .7 | | |
| | | .20 | .839 |
| Group I | -1.1 | | |
| | | 2.17 | .036 |
| Group III | -9.2 | | |
| Written Language | | | |
| Group II | -4.5 | | |
| | | 1.18 | .243 |
| Group I | -5.3 | | |
| | | .93 | .362 |
| Group III | -8.6 | | |

[a]Samples for groups were 23 (Group I), 25 (Group II), and 22 (Group III).

[b]Analysis compared the ranks of Groups I and II and the ranks of Groups I and III.

Table 7

Analysis of Mean Percentile Ranks of Groups I, II, and III on Woodcock-Johnson Achievement Clusters[a]

| Cluster | Mean %ile Rank | t[b] | p |
|---|---|---|---|
| Reading | | | |
| Group II | 30.2 | | |
| | | .52 | .607 |
| Group I | 27.6 | | |
| | | 1.15 | .258 |
| Group III | 22.5 | | |
| Math | | | |
| Group II | 34.1 | | |
| | | .40 | .694 |
| Group I | 36.9 | | |
| | | 2.07 | .045 |
| Group III | 23.1 | | |
| Written Language | | | |
| Group II | 23.7 | | |
| | | .77 | .447 |
| Group I | 27.3 | | |
| | | .78 | .442 |
| Group III | 23.0 | | |

[a]Samples for groups were 23 (Group I), 25 (Group II), and 22 (Group III).

[b]Analysis compared the ranks of Groups I and II and the ranks of Groups I and III.

Table 8

Two-Way ANOVA for Dependent Variable Social Behavior with Referral Status and Sex as Independent Variables

| Source of Variance | Degrees of Freedom | Mean Squares | F-Value | Significance |
|---|---|---|---|---|
| Referral | 1 | 442.1 | .64 | .427 |
| Sex | 1 | 1141.3 | 1.65 | .205 |
| Interaction | 1 | 2270.0 | 3.30 | .076 |
| Residual | 43 | 688.5 | | |

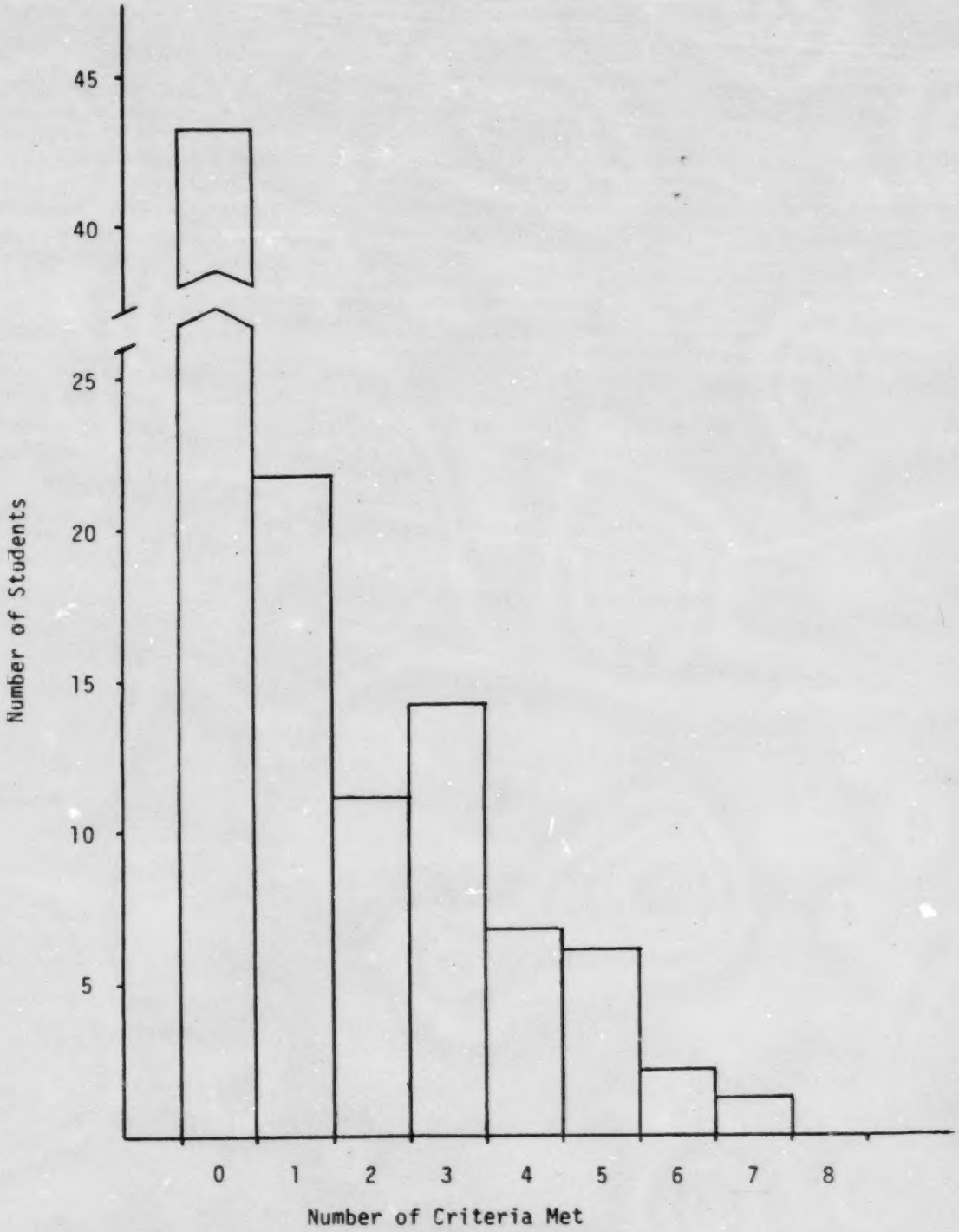


Figure 1. Frequency Distribution of Students Meeting Referral Criteria

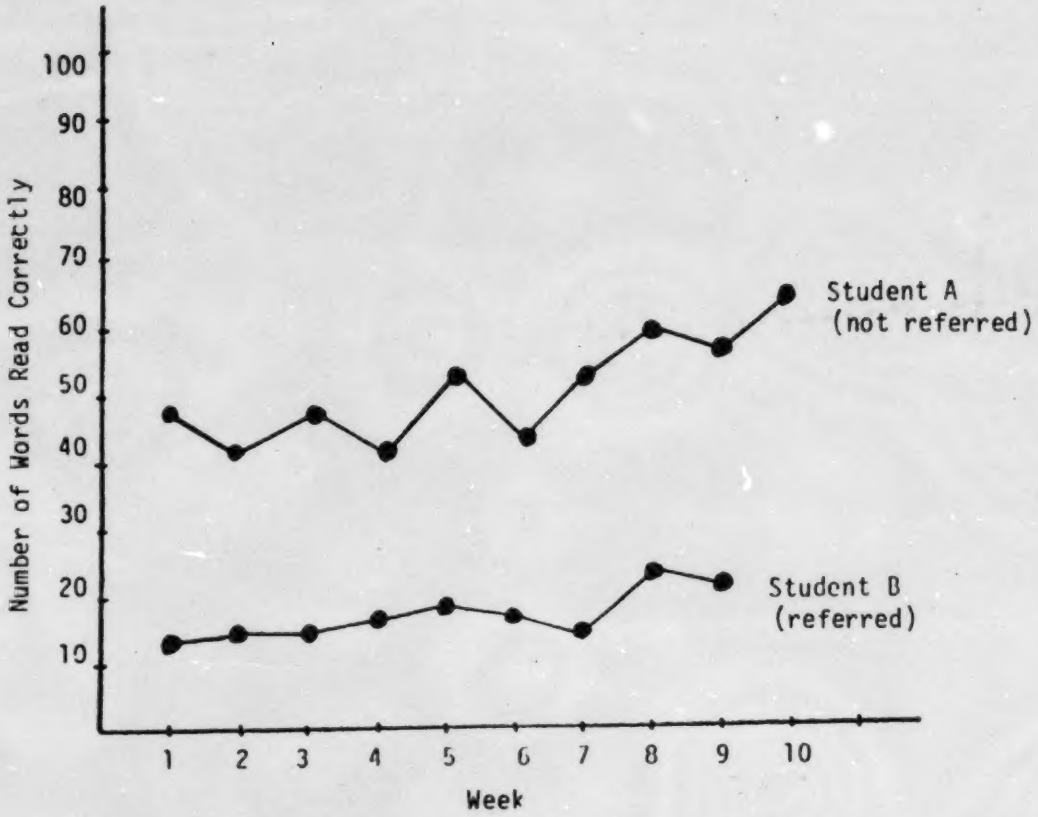


Figure 2. Graphic Display of Continuous Measurement of Reading Performance of Two Students Included in the Referral Study.

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